



MACHAKOS UNIVERSITY

University examination for 2024/2025 academic year

**SCHOOL OF AGRICULTURE, ENVIRONMENT & HEALTH SCIENCES
DEPARTMENT OF AGRICULTURAL SCIENCES**

**SECOND YEAR FIRST SEMESTER EXAMINATION
BACHELOR OF AGRICULTURAL EDUCATION AND EXTENSION**

SOL 201: SOIL FERTILITY AND PLANT NUTRITION

Date:

Time:

INSTRUTION: Answer Question ONE and any Other Two Questions.

QUESTION ONE (30 MARKS)

- a) Explain four characteristics of an ideal soil. (4 marks)
- b) Discuss any three (3) factors that you would consider when choosing a fertiliser to apply on a given cropped field. (3 marks)
- c) Calculate the amounts of N, P and K in a fertilizer bag with an analysis of 13-27-12 (5 marks)
- d) Discuss the methods of movement of nutrients from the soil to plant roots (3 marks)
- e) Describe Foliar Applications of fertilizers on the farm (3 marks)
- f) Using relevant examples, explain the chemical composition of liming materials. (2 marks)
- g) The type of organic matter, the way it is applied for incorporated into soil and the way it is decomposed influence the physical, chemical and biological balances in the soil and determine the various impacts. Explain (4 marks)
- h) You have been tasked to carry out a diagnosis of the soil-plant system in order to advise Machakos farmers on management of a seemingly failing maize crop. Explain three approaches for this exercise. (6 marks)

QUESTION TWO (20 MARKS)

- a) Nitrogen is an essential macronutrient in plant nutrition. Explain:
 - i) Four deficiency symptoms of N (4 marks)
 - ii) Six excess or toxicity symptoms of N (12 marks)
- b) Explain wilting in plants and its possible causes (8 marks)

QUESTION THREE (20 MARKS)

- a) Discuss three sources of plant available phosphorous and its excess or toxicity symptoms. (10 marks)
- b) Organic matter is an important component of fertile soils.
 - i) What are its benefits on the soil physical characteristics? (5 marks)
 - ii) Explain the adverse effects of organic matter additions. (5 marks)

QUESTION FOUR (20 MARKS)

- a) Explain three processes by which nutrient ions are brought into proximity with plant roots for absorption. (10 marks)
- b) Outline four plant available forms of potassium and its deficiency symptoms. (10 marks)

QUESTION FIVE (20 MARKS)

- a) Explain how do Liming agents neutralize acidity in soils (6 marks)
- b) Explain the management of phosphorus fixation in soils. (5 marks)
- c) The fertilizer salt index was developed to classify fertilizers according to their potential to cause salt injury to plants. Discuss these salt indices. (9 marks)